

## REMARKS

Claims 1, 4, 6, 9-13, 15, and 21 are pending in this Application. Applicants have amended claim 6. No new matter is added.

More specifically, Applicants submit that the first layer of the amended claim 6 is the same as the first layer of the previously presented claim 1. Therefore, no new issue is added by this Amendment.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1, 4, 6, 9-13, 15, and 21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kryliouk (US Patent No. 6,350,666) in view of Ichinose et al. (EP 1367657A2, hereinafter “Ichinose”).

Applicants respectfully traverse this rejection in the following discussion.

### I. THE CLAIMED INVENTION

The claimed invention (e.g., as defined by exemplary claim 1) is directed to a semiconductor layer.

The semiconductor layer includes a first layer including a Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate, and a second layer including a nitride surface of said first layer containing oxygen and nitrogen.

In a conventional semiconductor layer, as described in the Background of the present Application, semiconductor layer includes an Al<sub>2</sub>O<sub>3</sub> substrate made of Al<sub>2</sub>O<sub>3</sub>, an AlN layer, which is formed on a surface of the Al<sub>2</sub>O<sub>3</sub> substrate, and a GaN growth layer which is formed on the AlN layer through epitaxial growth (e.g., see Application at page 1, lines 15-19).

By applying the conventional semiconductor layer, the lattice constants of the AlN layer and the GaN growth layer cannot be perfectly made match each other, and thus it is difficult to further enhance crystal quality of the GaN growth layer. In addition, when the conventional semiconductor layer is applied to a light emitting element, crystalline of a

luminous layer is degraded, and luminous efficiency is reduced (e.g., see Application at page 2, lines 2-9).

The claimed invention, however, provides a semiconductor layer, in which a first layer including a Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate, and a second layer includes a nitride surface of said first layer containing oxygen and nitrogen (e.g., see Application at page 2, line 21 – page 3, line 1).

With this structure, the second layer which has the GaN system compound semiconductor with high crystalline could be obtained without interposing a buffer layer. Hence, when the GaN system epitaxial layer is formed on the second layer, the lattice constants of the second layer and the GaN system epitaxial layer can match each other, and thus the GaN system epitaxial layer having the high crystal quality could be obtained (e.g., see Application at page 12, lines 1-13).

## II. THE PRIOR ART REJECTION

In rejecting claims 1, 4, 6, 9-13, 15, and 21, the Examiner alleges that one of ordinary skill in the art would have combined Kryliouk with Ichinose to render obvious the claimed invention.

Applicants respectfully submit that the references would not have been combined as alleged by the Examiner and that, even if combined, the alleged combination of references would not teach or suggest each and every feature of the claimed invention.

However, in the interest of expediting prosecution, Applicants note that the present application has a foreign priority date (August 8, 2003) which is prior to the publication date (December 3, 2003) of Ichinose.

Applicants file herewith a verified translation of the priority document to perfect the priority date/claim and to remove Ichinose as a reference. Therefore, Ichinose is not prior art against the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

Furthermore, Applicants submit that Kryliouk and Ichinose, either alone or in combination (arguendo) fail to teach or suggest, “*a second layer comprising a nitride surface of said first layer containing oxygen and nitrogen,*” (emphasis added by Applicants) as recited in claim 1, and similarly recited in claims 6 and 21.

The Examiner alleges that Kryliouk teaches this feature of the claimed invention. Specifically, the Examiner bases the rejection upon column 3, lines 20-40 and columns 11-12 of Kryliouk, and alleges that the references teaches a nitride surface of a first layer that has oxygen and nitrogen. The Examiner, however, is clearly incorrect.

Applicants respectfully submit that the Examiner's allegations are based on improper hindsight and the Examiner has failed to establish *prima facie* case of obviousness.

That is, Kryliouk teaches a LiGaO<sub>2</sub> substrate that is covered with a nitride layer, which the Examiner attempts to equate to the claimed second layer. Kryliouk, however, merely teaches that the alleged nitride layer includes a GaN film (column 3, lines 20-40 and columns 11-12). Indeed, contrary to the Examiner's allegations, Kryliouk in column 3, lines 20-40 and columns 11-12 (or anywhere else, for that matter) fails to teach or suggest that the alleged nitride layer includes a nitride surface of the first layer containing oxygen and nitrogen, as recited in claims 1, 6, and 21. Therefore, Kryliouk fails to satisfy the plain meaning of the claim language with regard to the claimed feature, and thus, fails to teach or suggest this feature of claims 1, 6, and 21.

With the claimed structure, the second layer which has the GaN system compound semiconductor with high crystalline could be obtained without interposing a buffer layer. Hence, when the GaN system epitaxial layer is formed on the second layer, the lattice constants of the second layer and the GaN system epitaxial layer can match each other, and thus the GaN system epitaxial layer having the high crystal quality could be obtained (e.g., see Application at page 12, lines 1-13).

Kryliouk and Ichinose do not even recognize this problem, let alone teach or suggest (and thus provides a much different structure than) a solution similar to that of the present invention. Therefore, the alleged combination of the references fails to teach or suggest this feature of the claimed invention.

Moreover, Applicants submit that Kryliouk and Ichinose, either alone or in combination (*arguendo*) fail to teach or suggest, "*a first layer comprising a Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate; and a second layer comprising a nitride surface of said first layer containing oxygen and nitrogen*," (emphasis added by Applicants) as recited in claim 1, and similarly recited in claims 6 and 21.

Kryliouk's deficiencies with regard to claims 1, 6, and 21 are clear and, as admitted

by the Examiner, the alleged reference fails to teach or suggest the claimed Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate.

The Examiner attempts to rely on Ichinose for making up the deficiencies of Kryliouk. Specifically, the Examiner improperly attempts to use the claimed invention as a roadmap by a direct substitution of the LiGaO<sub>2</sub> substrate in Kryliouk with the alleged Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate of Ichinose.

Applicants submits that the Examiner's allegations are based on improper hindsight and based on the following reasons, one with ordinary skill in the art would not have combined the references as alleged by the Examiner. Further, since the alleged combination would not result in reasonable expectation of success, the Examiner has not established *prima facie* case of obviousness.

First, Applicants respectfully bring to the Examiner's attention that one having ordinary skill in the art would not simply substitute a different substrate (i.e., Ga<sub>2</sub>O<sub>3</sub> system single crystal) and its surface oxide that forms a second layer, as alleged by the Examiner, into a functioning device (i.e., system in Kryliouk), since such direct substitution of substrate and its alleged surface oxide may render the device as non-functional. Thus, no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Stated slightly differently, in the wording of KSR, "out-of-context" translates to failure to demonstrate predictable results.

Secondly, Applicants submit that it is clear that obviousness does not result simply because the claimed invention can be achieved, as explained in MPEP, "*The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art. KSR International Co. v. Teleflex Inc., 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1396 (2007).*"

Since there is no objective evidence currently of record that supports the Examiner's conclusory statement, one with ordinary skill in the art would not have combined Kryliouk with Ichinose, as alleged by the Examiner.

Thirdly, Applicants dispute the Examiner's reasoning for obviousness in combining Kryliouk with Ichinose, "*based on its known suitability for its intended use*" (Office Action at page 2, last paragraph).

Applicants respectfully submit that it is unclear how the Examiner came to this conclusion and request a more detailed explanation as to how such an alleged advantage would come to fruition.

Indeed, the Examiner merely makes a circular argument wherein the motivation to modify the primary reference is to obtain the benefits of having modified it.

Accordingly, Applicants submit that the Examiner's conclusion of obviousness is based on improper hindsight reasoning, since there is no reasonable rationale articulated to modify Kryliouk.

Applicants respectfully submit: "*Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness*" (In re Kahn, 441 F. 3d 977, 988 (CA Fed. 2006)).

If the Examiner wishes to maintain this rejection, the Examiner must provide an articulated reasonable rationale to explain why one of ordinary skill would have combined each feature of Kryliouk that the Examiner is attempting to combine with Ichinose.

Fourthly, Applicants submit that the alleged direct substitution of the LiGaO<sub>2</sub> substrate in Kryliouk with the alleged Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate of Ichinose would change the principle of operation of Kryliouk.

That is, based on the Examiner's allegations, a direct substitution of the LiGaO<sub>2</sub> substrate in Kryliouk with the alleged Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate of Ichinose would result in a device that partially includes the alleged Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate, but there is a nitride layer of Kryliouk's device covering the alleged Ga<sub>2</sub>O<sub>3</sub> system single crystal substrate, whereas other cover layers of Kryliouk are untouched. This would clearly change the principle of operation of Kryliouk with partially substituted elements and layers in its functioning system.

Such change in principle of operation means the Examiner has not established a *prima facie* obviousness rejection, as explained in In re Gorden, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) "*If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification*" (see MPEP 2143.01(V)), and in In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) "*If the proposed modification or combination of the prior art*

*would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious*" (see MPEP 2143.01(VI)).

Finally, Applicants respectfully submit that the Examiner has not considered the invention as a whole for what it fairly teaches. Instead, the Office Action attempts to establish the obviousness of the claimed invention merely by identifying the individual elements of the claims and citing references to show the elements. That is, the stated grounds of rejection merely identify features, which are alleged to correspond to individual elements of the claims, in a series of somewhat related references.

However, Applicants note that it is not enough merely to show that each of the individual elements of the claims is taught by the combination of references, or for that matter, even that the elements *could* be combined as alleged. Instead, the Examiner also must show that it would have been obvious to combine the references to arrive at the invention as a whole.

That is, the question is not merely whether the differences themselves between the claimed invention and the cited references would have been obvious, but whether the claimed invention as a whole would have been obvious from the cited references (e.g., see M.P.E.P. § 2141.02).

Accordingly, Applicants respectfully submit that none of the cited references, either alone or in combination, discloses or suggests the novel and unobvious combination of elements of the claimed invention, when considered as a whole.

Furthermore, Applicants submit that in rejecting claims 4, 9, 10, and 15, the Examiner has not provided any reasoning for combining the features of Kryliouk with Ichinose.

Applicants would again point out that "*Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.*" (In re Kahn, 441 F. 3d 977, 988 (CA Fed. 2006)).

Accordingly, if the Examiner wishes to maintain this rejection, the Examiner is requested to provide an articulated reasonable rationale to explain why one of ordinary skill would have combined each feature of Kryliouk that the Examiner is attempting to combine with Ichinose.

Moreover, Applicants respectfully submit that these references are unrelated and would not have been combined as alleged by the Examiner. Thus, a person of ordinary skill in the art would not have considered combining these disparate references, absent impermissible hindsight.

Further, Applicants submit that there is no motivation or suggestion in the references or elsewhere (and thus no predictability for one of ordinary skill in the art) to urge the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicants respectfully submit that one of ordinary skill in the art would not have combined the references as alleged by the Examiner.

Furthermore, Applicants submit that the first layer of the amended claim 6 is the same as the first layer of the previously presented claim 1. Therefore, no new issue is added by this Amendment.

Therefore, Applicants respectfully submit that one with ordinary skill in the art would not have combined Kryliouk with Ichinose, and even if combined, the alleged combination does not teach or suggest (or render obvious) each and every feature of the claimed invention. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

### **III. FORMAL MATTERS AND CONCLUSION**

In view of the foregoing, Applicants submit that claims 1, 4, 6, 9-13, 15, and 21, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

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The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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Date: \_\_\_\_\_

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